

**WHAT IS CLAIMED IS:**

1. A process for manufacturing ratchet wheels, comprising the steps of:

(1) creating a master mold consisting of an upper and a lower mold part,

the upper mold part having a number of posts each of which has a sidewall which is complementary in shape to a driving recess of a finished product of a ratchet wheel, the lower mold part having a number of round cavities, the posts being designed for being inserted into their respective round cavities formed on the lower mold part;

(2) forming a wax pouring space by assembling the upper and lower mold parts together, of which the wax pouring space comprising a number of annular pouring cavities enclosed by the round cavities and the posts, each of the annular pouring cavities being a copy of a cast product of the ratchet wheel;

(3) injecting melt wax into the pouring-cavities to form a wax pattern;

(4) forming a finished wax pattern by separating the mold parts from each other after the melt wax is solidified;

(5) forming a pattern tree by stacking the finished wax pattern made according to the above steps atop another;

(6) forming a shell by dipping the pattern tree into a slurry and then drying the same;

(7) dewaxing the pattern tree by heating;

(8) solidifying molten metal which is poured into an empty cavity left by the pattern tree; and

(9) destroying the shell to form cast products of the ratchet wheels.

2. The process for manufacturing ratchet wheels as claimed in Claim 1, further comprising the steps of:

(1) polishing and cleaning the cast products;

- 5 (2) forming two annular grooves by machining the cast products with a CNC lathe on their respective sidewalls of the cast products to form annular semi-products;
- (3) forming a plurality of teeth on respective sidewalls of the semi-products by milling the semi-products to form finished products.
3. A process for manufacturing ratchet wheels comprising the steps of:
- (1) creating a master mold consisting of upper and lower mold parts,
- the upper mold part having a number of posts each of which has a sidewall being complementary in shape to a driving recess of a finished product of a ratchet wheel, the lower mold part having a number of round cavities, the posts being designed for being inserted into their respective round cavities formed on the lower mold part;
- 5 (2) forming a molding cavity by assembling the upper and lower mold parts together, of which the molding cavity comprises a plurality of cavities enclosed by their respective round cavities and posts;
- 10 (3) kneading a mixture of fine metal powders and binder system together in an extruding machine under heat and pressure to create a melt feedstock mixture;
- (4) forming a green compact by injecting the kneaded feedstock mixture into the molding cavity under pressure;
- 15 (5) forming cast products having a desired shape by separating the mold parts from each other after the green compact cools;
- (6) debinding the cast products; and
- (7) sintering the cast products.
4. A process for manufacturing ratchet wheels, comprising the steps of:
- (1) loading metal powders having a uniform density into a molding cavity of a die;
- (2) forming a green part by axially compacting the metal powders under pressure created by an upper and a lower press part of a forming machine;

- 5 (3) ejecting the green part from the die by removing the upper press part;
- (4) heat-treating the green part by sintering;
- (5) forming an annular semi-product by providing two annular grooves on a sidewall of the green part; and
- 10 (6) forming a finished product by providing a plurality of teeth on the sidewall of the semi-product.

5. A process for manufacturing ratchet wheels comprising the steps of:

- (1) forming a cylindrical forging billet by hot or cold forging, of which the forging billet having a thru hole consisting of inter-communicating recesses which are pre-formed in a forging die;
- 5 (2) providing a broach having teeth formed thereon;
- (3) machining the forging billet into a workpiece having a sidewall with two annular grooves on the sidewall;
- (4) forming a semi-product having a driving recess which is complementary in shape to the teeth by operating the broach through the workpiece along the thru hole and;
- 10 (5) forming a finished product having a plurality of teeth on a sidewall thereof by milling the semi-product.

6. A process for manufacturing ratchet wheels comprising the steps of:

- (1) forming a cylindrical forging billet by hot or cold forging, of which the forging billet having a thru hole consisting of inter-communicating recesses which are pre-formed in a forging die;
- 5 (2) providing a broach having teeth formed thereon;
- (3) shaping the thru hole into a driving recess having a desired shape by operating the broach through the forging billet along the thru hole;

(4) forming a semi-product having a sidewall and two annular grooves formed on the sidewall by machining the forging billet ; and

10 (5) forming a finished product having a plurality of teeth on the sidewall thereof by milling the semi-product.

7. A process for manufacturing ratchet wheels comprising the steps of:

(1) forming a cylindrical forging billet by hot or cold forging, of which the forging billet having a thru hole consisting of inter-communicating recesses which are pre-formed in a forging die;

5 (2) machining the forging billet into a workpiece having a sidewall with two annular grooves formed on the sidewall;

(3) forming a semi-product by punching the workpiece along the thru hole to form a driving recess with a desired shape;

10 (4) forming a finished product having a plurality of teeth on the sidewall thereof by milling the semi-product.

8. A process for manufacturing ratchet wheels comprising the steps of:

(1) forming a cylindrical forging billet by hot or cold forging, of which the forging billet having a thru hole consisting of inter-communicating recesses which are pre-formed in a forging die;

5 (2) shaping the thru hole into a driving recess having a desired shape by punching the forging billet along the thru hole;

(3) forming a semi-product having a sidewall and two annular grooves formed on the sidewall by machining the forging billet; and

10 (4) forming a finished product having a plurality of teeth on the sidewall thereof by milling the semi-product.